

## PATENT SPECIFICATION

Convention Date (United States): July 13, 1937.

520,025

Application Date (in United Kingdom): July 12, 1938.

No. 20696/38.

Complete Specification Accepted: April 12, 1940.



## COMPLETE SPECIFICATION

## Improvements in or relating to Refractory Alloy Compositions

I, CLEMENS ALBERT LAISE, a Citizen of the United States of America, of 32, Knickerbocker Road, Tenafly, in the County of Bergen and State of New Jersey, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is for improvements in or relating to refractory alloy compositions and has for one of its objects to produce a composition which does not unduly disintegrate when subjected to high temperatures or to electronic bombardment. Another object is to produce an incandescent filament which will have little or no tendency to sag and will hold its shape at high temperatures.

The composition forming the subject of the present invention is particularly suitable for use in the form of sheets, discs or rods as X-ray targets or electrical make-and-break contacts, or electrodes, and in the form of fine wire as filaments for incandescent lamps and particularly concentrated lamp filaments operated at high efficiency and high temperature.

The invention provides a refractory alloy composition consisting of more than 90% tungsten, less than 10% rhenium and not more than 1% vanadium. The inclusion of the rhenium and vanadium alloyed with the tungsten is found to result in a composition having a very high melting point and also a high vaporisation point. The invention includes a metallic body consisting of such a composition which has been heat treated in reducing gas at a white heat whereby the grains are caused to coalesce. The resulting structure is found to assist in withstanding any tendency to disintegrate or become distorted.

The invention comprises an incandescent filament formed from an alloy composition or a metallic body as aforesaid. In the latter case the filament is preferably subjected to a final heat treatment in the coil form at high incandescence.

A filament produced from this composition has a higher resistance than the customary tungsten filaments, and concentrated coil filaments, particularly

when subjected to special heat treatment as described later, will have little tendency to sag and will hold their shape without distortion at a higher vaporisation point than the usual tungsten filaments. This is especially true when the filament is shaped into dual or triple coils.

A composition of matter comprising an alloy of tungsten, rhenium and vanadium in accordance with the invention may consist of large interlocking grains bonded together with an intergranular cement, whereby the rate of disintegration and the rate of distortion are reduced to a minimum. The substances which are added to the tungsten base produce an alloy which, when subjected to suitable heat treatment, has a structure as aforesaid wherein the intergranular cement consists in part of the alloy constituents. Electrical contacts made of such large grain structure have little tendency to disintegrate, and coiled incandescent lamp filaments and the like of similar structure neither become distorted nor vaporised at high temperatures.

The invention also provides the process for producing a refractory alloy composition as aforesaid which comprises slurring into tungsten oxide a solution of potassium tungstate and an alkaline vanadate, drying the mixture to powder form, reducing the powder, mixing finely-divided metallic rhenium with the reduced powder to form a homogeneous mixture, and heat treating said mixture. Assuming a filament is to be formed, the presence of potassium tungstate and vanadium obtained from the vanadate tend to direct the growth of crystals in a longitudinal direction so as to produce large interlocking grains and the vanadium tends to toughen the composition and make it less sagging at higher temperatures.

There will now be described in detail the preferred manner of carrying out the invention.

The first step in the manufacture of the present alloy compositions consists in producing purified tungsten oxide by any of the processes well known in the art. After the tungsten oxide is precipitated and washed there is slurried into it a solution of potassium tungstate and sodium vana-

[Price 1/-]

Price 3s. 6d.

quently lamps made with this alloy will withstand much greater shock and they are particularly suitable for train-lighting, and for use with moving picture cameras and the like.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A refractory alloy composition consisting of more than 90% tungsten, less than 10% rhenium and not more than 1% vanadium.
2. A metallic body consisting of a composition according to claim 1 which has been heat treated in reducing gas at a white heat whereby the grains are caused to coalesce.
3. An incandescent filament formed from an alloy composition according to claim 1 or from a metallic body according to claim 2.
4. An incandescent filament according to claim 3 formed from a metallic body according to claim 2, which has been sub-

jected to a final heat treatment in the coil form at high incandescence.

5. An incandescent filament according to claim 3 in the form of a coil.

6. The process for the production of a refractory alloy composition according to claim 1, which comprises slurring into tungsten oxide a solution of potassium tungstate and an alkaline vanadate, drying the mixture to powder form, reducing the powder, mixing finely-divided metallic rhenium with the reduced powder to form a homogeneous mixture, and heat treating said mixture.

7. The refractory alloy composition and articles made therefrom substantially as described.

8. The method of producing a refractory alloy composition substantially as described.

Dated this 12th day of July, 1938.

BOULT, WADE & TENNANT,  
111/112, Hatton Garden,  
London, E.C.1,  
Chartered Patent Agents.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1940.

ND